

I CLAIM:

1. A positive pressure vapor fuel injection system comprising:
an air pump adapted to generate timed and metered charges of pre-heated air;
5 a fuel injector adapted to emit timed and metered charges of fuel, the charges of air being adapted to push the respective charges of fuel into a heat exchanger where the charges of fuel are converted into respective metered charges of fuel vapor;
an engine cylinder assembly including a fuel combustion
10 chamber and an engine intake valve with a guide body defining nozzles through which the respective charges of fuel vapor are adapted to be delivered; and
an air intake manifold operatively associated with the engine cylinder assembly and engine intake valve whereby air flowing through the air intake port of said air intake manifold is adapted to mix with the respective charges
15 of fuel vapor at the point of entry into the fuel combustion chamber.
2. The positive pressure vapor fuel injection system of claim 1 wherein a timing belt operatively connects the air pump to an engine shaft.
3. The positive pressure vapor fuel injection system of claim 1 wherein a gear operatively connects the air pump to an engine shaft.
- 20 4. The positive pressure vapor fuel injection system of claim 1 wherein the heat exchanger comprises an elongate conduit wrapped around an engine exhaust conduit.
5. The positive pressure vapor fuel injection system of claim 1 further comprising a pressure relief control valve operatively associated and
25 positioned between the heat exchanger and the fuel vapor delivery nozzle, the relief control valve being set at a relief pressure to allow respective injections of the fuel vapor charges to be timed approximately to the opening and closing of the engine intake valve.
6. The positive pressure vapor fuel injection system of claim 1
30 wherein the air pump is a timed axial pump with swash plate.

7. A positive pressure vapor fuel injection system adapted for use in connection with an engine including an air intake manifold operatively associated therewith and an intake valve having an intake valve guide associated therewith, the air intake manifold being positioned in a relationship wherein intake
5 air traveling through the intake manifold is drawn into the engine at a point below the outlet of an intake valve guide injection nozzle associated with the intake valve guide, the fuel injection system comprising means for feeding timed charges of vaporized fuel through the body of said intake valve guide and subsequently mixing the charges of vaporized fuel with said intake air at the point adjacent the outlet of
10 the body of said intake valve guide.

8. The positive pressure vapor fuel injection system of claim 7 wherein the means for vaporizing the fuel comprises:
an air pump adapted to generate timed charges of pre-heated air; and
a fuel injection assembly including a fuel injector adapted to
15 generate timed charges of fuel and the air being adapted to push the respective timed charges of fuel out of the fuel injection assembly into a heat exchanger where the timed charges of fuel are converted into said charges of vaporized fuel.

9. The positive pressure vapor fuel injection system of claim 7 wherein a timing belt operatively connects the air pump to an engine shaft.

20 10. The positive pressure vapor fuel injection system of claim 7 further comprising a pressure relief control valve operatively associated and positioned between the heat exchanger and the intake valve guide injection nozzle, the relief control valve being set at a relief pressure to allow respective injections of the fuel vapor charges to be timed approximately to the opening and closing of the
25 engine intake valve.

11. The positive pressure vapor fuel injection system of claim 7 further including a collar surrounding the body of said intake valve guide, said collar and said body of said intake valve guide defining bores in vapor flow communication and adapted to carry said charges of vaporized fuel through said
30 intake valve guide injection nozzle.

12. A vapor fuel injection system adapted for delivering timed charges of fuel vapor into an engine including a plurality of cylinders, the system comprising:

5 a plurality of fuel injectors operatively associated with the engine cylinders respectively and adapted to emit timed charges of fuel;

an air pump including a plurality of air cylinders operatively dedicated to the plurality of fuel injectors and the plurality of engine cylinders respectively and adapted to produce timed charges of air;

10 a plurality of air delivery conduits extending between the air cylinders and fuel injectors respectively, the conduits being sized and adapted to increase the velocity and temperature of the air flowing therethrough;

a plurality of heat exchange conduits operatively associated with the plurality of fuel injectors respectively, the timed charges of air being adapted to push the respective timed charges of fuel into and through the heat exchange conduits respectively wherein the timed charges of fuel are converted into timed charges of fuel vapor;

15 a plurality of intake valve guide fuel vapor delivery nozzles operatively associated at one end with the plurality of heat exchange conduits respectively and at the other end with the engine cylinders respectively, each of the fuel vapor delivery nozzles being defined in respective intake valve guide bodies through which the respective timed charges of fuel vapor are adapted to flow;

20 a control relief valve operatively associated with each of the heat exchange conduits for controlling the pressure of the timed charges of fuel vapor; and

25 an air intake manifold operatively associated with the engine cylinders and adapted to deliver charges of intake air into the engine cylinders respectively, the air intake manifold including an air intake port and the fuel vapor delivery nozzles being positioned and oriented relative to one another whereby the timed charges of fuel vapor and intake air are mixed together at the point of entry
30 into the respective engine cylinders.

13. The positive pressure vapor fuel injection system of claim 12 wherein a timing belt operatively connects the air pump to an engine shaft.

5 14. The vapor fuel injection system of claim 12 wherein a collar surrounds each of the intake valve guide bodies, the collar and the guide bodies respectively defining bores therein defining cooperating and interconnected passages for said timed charges of fuel vapor, said passages in said respective intake valve guide bodies terminating in said respective fuel vapor delivery nozzles, said fuel vapor being adapted to flow successively through said respective passages in said collar and said intake valve guide bodies and said fuel vapor delivery
10 nozzles respectively.

15 15. In a vapor fuel injection system adapted for delivering timed charges of fuel vapor into an engine cylinder, the system including an intake valve having a guide body surrounded by a collar, the collar defining a first fuel vapor delivery passage in vapor flow communication with a second fuel vapor delivery passage extending through the guide body and terminating at the distal end of said guide body into a vapor fuel delivery nozzle.

20 16. The vapor fuel injection system of claim 15 wherein the collar has inner and outer circumferential surfaces and a body therebetween, said fuel vapor delivery passage in said collar being defined by a first bore extending radially inwardly into the collar from the outer surface thereof and a circumferential groove extending into the inner surface and in vapor flow communication with said first bore, said second fuel vapor delivery passage in said guide body of said intake valve being defined by a plurality of bores extending longitudinally therethrough between the groove in said collar and said distal end of said guide body.

25 17. The vapor fuel injection system of claim 16 wherein the plurality of bores extend through said guide body in a spaced-apart, parallel circumferential relationship.